LIMITED-OPENING DOOR HINGE

BACKGROUND AND SUMMARY OF THE INVENTION

The invention relates to a hinge for doors having a swivel catch. More particularly, the invention relates to doors for motor vehicles in which the hinge pin in a first axial region and the hinge plate which can be rotated, are provided with mutually matching profiles in the form of a plurality of wedge-shaped cams. The cams protrude radially outwards or inwards beyond imaginary cylindrical surfaces on the pin or in the hinge plate, respectively. The cams are offset by the same angle in the circumferential direction and taper off steeply again onto the cylindrical surfaces.

Swivelling doors frequently have a swivel catch which is intended to inhibit the free swivelling of the door. That is, the door automatically remains in at least one open position and/or that its swivelling movement is retarded to such an extent that it cannot slam to by itself.

Provision is thus made, in particular in the case of car doors, that they lock into place when swivelled fully open and can only be swivelled out of this lock with increased effort. The door also frequently has a further locking position at a smaller opening angle. The locking effect is designed such that the door, when the vehicle is standing on a slope within customary limits, cannot start to move by itself and slam to.

For this purpose, the door has a special component which is generally termed a door arrester. This component requires additional costs on design and manufacture. A car door, especially, with the frequent opening and closing is also subject to considerable wear and so the intended locking and braking effect is not ensured indefinitely.

(DE 44 06 824 C) proposes to integrate the function of this component into the hinge of the door. In this case, the pin of the hinge, in a first axial region, and also the

hinge plate which can be rotated, are provided with mutually matching profiles. The profiles are in the form of a plurality of wedge-shaped cams which protrude radially outwards or inwards beyond imaginary cylindrical surfaces on the pin or in the hinge plate, respectively. The cams are offset by the same angle in the circumferential direction and taper off steeply again onto the cylindrical surfaces.

In the event of wear of these profiles, the hinge can be readjusted. The inhibiting effect of the mutually matching profiles is produced again by correspondingly changing their angular position with respect to one another. For this purpose, the hinge pin is rotatable with respect to the hinge plate, forming a swivel bearing therewith. On the other hand, however, it also has to be fastened in this hinge plate in a rotationally fixed manner such that it cannot rotate unintentionally. The intended inhibiting effect would, as a result, be missing.

An object of the present invention is to specify a simple solution for fastening the hinge pin in the hinge plate bearing it. This solution permits the fastening position of the hinge pin in this hinge plate to be changed, preferably continuously but at least sensitively, and also to be reliably observed. The invention achieves this object by means of a hinge pin and hinge plate having matching profiles in the form of a plurality of wedge-shaped cams.

In a first embodiment, profiles of this type can be designed as cones whose axes lie coaxially to the swivelling axis of the hinge. This profile shape permits infinitely variable changing of the angular position of the hinge pin in the hinge plate. In this case, however, since there is only frictional engagement, unintentional changing

of the position of the hinge pin in the hinge plate cannot be ruled out under the effect of unusually high moments or if the clamping becomes loose.

In order to ensure absolutely captive fastening of the hinge pin in the hinge plate, provision is made in a further embodiment to design the profiles as intermeshing teeth.

Other objects, advantages and novel features of the present invention will become apparent from the following detailed description of the invention when considered in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the figures of the drawing the two embodiments are represented using the example of a hinge for a car door. Of course, the invention can also be used on hinges for other applications. In the drawings:

Fig. 1 shows the partially broken-away view of a first embodiment of the hinge according to the invention;

Fig. 2 shows the partially broken-away view of a second embodiment of the hinge according to the invention.

DETAILED DESCRIPTION OF THE DRAWINGS

As shown in Fig. 1, the hinge 1 has a first hinge plate 2 and a second hinge plate 3 which are connected to one another by a hinge pin 4. The hinge 1 is fastened, on one side of the hinge plates 2 and 3, to the body of a vehicle, and a door is fastened on the other side by means of screws which grasp through the holes 5. The hinge pin 4 rotates in a first axial region 6 in the hinge plate 2. Hinge pin 4 is fastened in a second axial region 7 in the other hinge plate 3.

The first axial region 6 of the hinge pin 4 and the bearing hole assigned thereto in the hinge plate 2 have mutually matching profiles 8 and 9, respectively. Profiles 8 and 9 are in the form of a plurality of wedge-shaped cams which protrude radially outwards or inwards beyond

imaginary cylindrical surfaces on the hinge pin or in the hinge plate, respectively. Profiles 8 and 9 are offset by the same angle in the circumferential direction and taper off steeply again onto the cylindrical surfaces. The rising incline of the cams and the angular position of the parts containing the profiles 8, 9 are selected such that, when the door swivels open, the surface pressure between the cams sliding onto one another increases until the swivelling movement is inhibited. A detailed description and representation of the design and manner of operation of a shaft/hub connection of this type is contained in DE 42 09 153 C2 which is mentioned in the introduction and which is herein incorporated by reference.

A nut 10, which can be screwed the threaded end region of the hinge pin 4, secures the hinge pin in the hinge plate 2 in interaction with a collar 11.

In the first embodiment of the invention according to Fig. 1, the profiles of the second axial region 7 of the hinge pin 4 and the bearing hole in the hinge plate 3 are of conical design. The conical surfaces 12 and 13 can be pressed together by means of a fastening screw 14. The hinge pin 4 and the hinge plate 3 are connected to one another non-positively in a rotationally fixed manner. The angle of taper, which for clarity is shown sharply exaggerated in the drawing, can be small so that, under a high surface pressure, a high retaining force against rotation can be achieved.

When the door is swivelled, the hinge pin 4 is rotated in the hinge plate 2. At the same time, the wedged surfaces of the profiles 8 and 9 slide on one another and progressively increase the frictional engagement between the parts. As a result, the swivelling movement is progressively inhibited. The extent of this inhibition can

be changed, with the door closed, by rotating the hinge pin 4 into another starting position and can be readjusted in the event of wear.

For this purpose, by loosening the screw 14, the fit of the conical surfaces 12, 13 is loosened and the hinge pin 4 is rotated, using a tool which engages over the circumference of the collar 11 at a key surface 15, to such an extent that the intended inhibiting effect occurs. To secure this new position of the hinge pin 4, the conical surfaces 12, 13 are pressed one into the other again in the new mutual position by tightening the fastening screw 14.

In the embodiment of Fig. 2, the hinge pin 4 is secured in the hinge plate 2 by means of a clamping ring 16, and in the hinge plate 3 by means of a nut 17 which can be screwed onto a thread at the upper end of the hinge pin. To secure the angular position between the hinge plate 3 and hinge pin 4, a profile in the form of teeth 18 on the second axial region 7 of the hinge pin 4 and in the hole in the hinge plate 3 is used. The intermeshing teeth 18 may be designed as a serration.

To change the rotational position of the hinge pin 4 in the hinge plate 3, the nut 17 is loosened. The hinge plate 3 is then pulled off from the hinge pin, i.e. the door is lifted up. The hinge pin 4 can then be rotated using a tool acting on the key surface 15. When this has happened, the hinge plate 3 is again placed onto the hinge pin 4, the teeth 18 intermeshing in another position. Finally, the hinge plate 3 is fastened again on the hinge pin 4 by means of the nut 17.

Since teeth 18 have to have a joining clearance, the hinge pin 4 and the hole in the hinge plate 3 are provided, at least on one side, with conical shoulders 19 . Shoulders 19 ensure the parts can be braced against one another as the nut 17 is being tightened and are prevented from rattling. The conical shoulder 19 which is adjacent to

the nut 17 is arranged in a separate part 20 which can be placed onto the hinge pin 4.

The foregoing disclosure has been set forth merely to illustrate the invention and is not intended to be limiting. Since modifications of the disclosed embodiments incorporating the spirit and substance of the invention may occur to persons skilled in the art, the invention should be construed to include everything within the scope of the appended claims and equivalents thereof.